

## PATENT ABSTRACTS OF JAPAN

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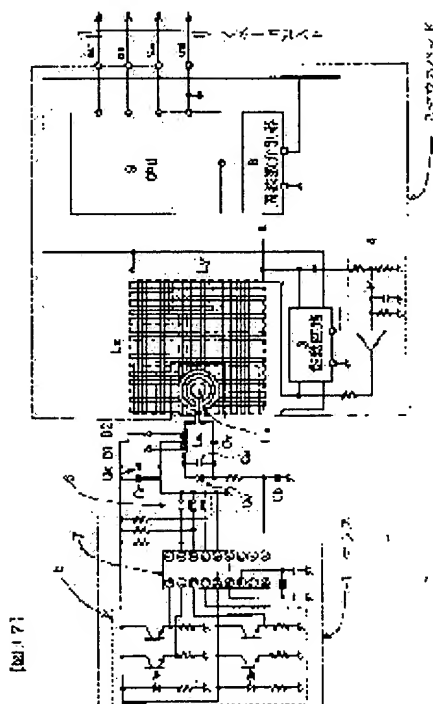
(72)Inventor : SHIMONO HEIHACHI

## (54) BATTERYLESS CORD-FREE MOUSE DEVICE

## (57)Abstract:

PROBLEM TO BE SOLVED: To wirelessly transmit the information of a computer mouse having cord-free constitution and to wirelessly transmit power supply for the mouse to the mouse.

SOLUTION: An oscillator is constituted by unifying the cord-free mouse with a mouse pad, and the oscillation frequency of the oscillator is determined by a constant of a resonance circuit in the mouse. Part of oscillation voltage is rectified in the mouse and used for mouse power supply. The information of an encoder or a button switch in the mouse is encoded by a CPU built in the mouse. The HI/LO voltage of the code is applied to a varactor diode constituting part of the resonance circuit to frequency-modulate the oscillation frequency. The modulated wave is taken out by the mouse pad side and demodulated by a frequency discriminator built in the mouse pad and the demodulated wave is transmitted to a computer through a CPU built in the mouse pad.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] An active circuit (3) is equipped in the mouse pad for computers (2), and (Ly) is connected with the pad coil (Lx) arranged so that a mutual inductance may be made into the minimum at the input/output port. A mouse coupling coil (Lm), an addition coil (La), and a resonant capacitor (Cm, calcium, Cv) are equipped in a mouse (1). the time of the mouse being employed on the mouse pad upper surface -- a coupling coil (Lm) -- minding -- a pad coil (Lx, Ly) -- electromagnetism -- the cell loess code free mouse equipment which joined together, oscillated and equipped the VCO with which the oscillation frequency is mainly determined by (Lm, La, Cm, calcium, Cv) in a mouse (1)-like

[Claim 2] VCO with the concentric circle-like coil which has the pitch of the pad coils Lx and Ly odd times the diameter of 1/2 as a mouse coupling coil Lm of a claim 1.

[Claim 3] Cell loess code free mouse equipment according to claim 1 characterized by preparing a tap in the suitable position of a mouse coil (Lm, La), for the diode for rectification (D1, D2) connected with the tap rectifying oscillation voltage, obtaining DC power supply, and supplying a power supply to the encoder (5) in a mouse (1), a microcomputer (7), etc.

[Claim 4] Cell loess code free mouse equipment characterized by changing into a serial code the encoder (5) generated within a mouse, and the information from mouse button (6) with a microcomputer (7), applying the output to a varactor diode (Cv), and carrying out frequency modulation of the VCO according to claim 1.

[Claim 5] VCO of the claim 1 characterized by preparing an automatic gain control circuit (4) in order to suppress changing the oscillation voltage of VCO by change of few degrees of electromagnetic coupling generated in case a mouse (1) moves on a mouse pad (2).

[Claim 6] By preparing a magnetic sheet (14) in the lower part of the coil layer of the pad coil (Lx, Ly) with which a mouse pad (2) is equipped at the upper part of a magnetic sheet (18) and a mouse coupling coil (Lm) Cell loess code free mouse equipment of the claim 1 characterized by making it not influenced by the quality of the material of the table on which a mouse pad (2) is placed while strengthening the electromagnetic coupling between a pad coil (Lx, Ly) and a mouse coil (Lm).

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TECHNICAL FIELD

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[The technical field to which invention belongs] this invention relates to the computer mouse equipment which realizes two points of eliminating the mouse code which accompanies the computer mouse which is a kind of the pointing device for computers, and making a mouse into a code free-lancer, and eliminating-cell which was needed conventionally driving mouse electrically in the case of parenthesis \*\*.

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PRIOR ART

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[Description of the Prior Art] The radio mouse called the cordless mouse or code free mouse which eliminated the mouse code from the computer mouse conventionally is marketed. However, this conventional kind of all mice are using the cell for driving a mouse electrically.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] In CAD (computer aid design) used by some experts from the Internet which spread quickly recently, or the former, even if 90% or more of computer employment time calls it operation of a mouse, it is not an overstatement. Under the present circumstances, it is clear that the radio mouse is more user-friendly than the conventional cable mouse. However, a power supply is required to drive a mouse electrically. Although it was satisfactory at all since the power supply was sent through the code from the computer with the cable mouse, if cordless, it was a big problem what the drive power supply of a mouse is carried out. With the conventional radio mouse, the cell has been used for avoiding this problem unexceptional. Apparently, although use of a cell seems to be an easy solution, it has burdened the radio mouse employment person with the big burden in fact. That is, the thing for which a cell must newly be purchased. A mouse must be equipped with it. And as a result of the biggest fault's serving as a cell piece when not expecting, and a mouse's stopping operating, problems, such as ~~discontinuation or halt striped \*\*\*\*~~, had the creation work of a documents drawing etc.

[0004] Furthermore, if a mouse is radio-ized, part cost will increase, and the present condition is that the spread with a distinct cable mouse is attached. Therefore, even if it turned out that it is convenient that there is no code, there was a problem referred to as more inelastic in need.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Since this invention is constituted as explained above, it has the effect which is indicated below.

[0025] Since two coils connected to the active circuit 3 which the mouse pad equipped, and this I/O constitute VCO by combining with the resonance circuit (Lm, La, Cm, calcium, Cv) with which the mouse was equipped, they rectify oscillation voltage by the mouse side, and can make DC power supply.

[0026] Since it is decided by the resonance circuit by the side of a mouse in large numbers that the oscillation frequency of VCO will be a target, frequency modulation of it can be carried out by impressing the serial code which a mouse CPU 7 outputs to a varactor diode Cv.

[0027] Since a frequency-modulation wave can be taken out by the mouse pad side, the radio transmission of a mouse signal is attained inevitably.

[0028] since even VCO comes out as mentioned above and generation of DC power supply and the radio transmission of a mouse signal are attained, there are few part mark and they can make cell loess code free mouse equipment from cheap cost

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MEANS

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[Means for Solving the Problem]

[0005] A technical problem is solved with a means by which a means to obtain a mouse drive power supply on radio, and a means to tell mouse information were united as explained below in the mouse equipment of this invention.

[0006] A mouse should equip with an active circuit the mouse pad surely employed on it, and this invention should possess the VCO which carries out a RF oscillation by the electromagnetic coupling generated between the coil by the side of a mouse, and the coil of a mouse pad. Obtain the drive power supply for mice by carrying out conversion into dc of the oscillation energy.

[0007] Moreover, the oscillation frequency of VCO should be designed to be decided by resonance frequency of the mouse coil with which the mouse side was equipped, and a resonant capacitor, and should carry out frequency modulation of the oscillation frequency with the output of the microcomputer (it calls Following CPU) which carries out the serial coding of the encoder or button information in a mouse.

[0008] It is extracted by the mouse pad side, and it comes out using a frequency discriminator, and gets over in a serial code, and the oscillation voltage by which frequency modulation was carried out is sent to CPU with which a mouse pad is equipped. Therefore, the radio transmission of mouse information is attained inevitably.

[0009] Since a means to obtain the drive power supply for mice, and a means to tell mouse information are performed by one VCO, a circuit is minimized and a low cost is realized.

[0010]

[Embodiments of the Invention] The view 1 shows the form of employment of the mouse equipment of this invention. Although the pad for mice is well used in order to improve slipping of a mouse main part in the usual cable mouse, and to prevent a slip of a mouse ball, the employment form of the same pad one apparatus is taken also by the method of this invention. A different point from a cable mouse is a point that the code connected with a computer at the mouse pad side which there is no mouse code in a mouse main part, and is used for a mouse main part and a pair by becoming is attached. Therefore, a mouse employment person is wide opened from troublesomeness with a code in mouse operation. Although many things which call a separate type as other operation forms of a radio mouse, and use a mouse main part and a receive section, detaching them several 10cm or more are also seen, in that the troublesomeness of a code is opened, both do not change at all. However, when it thinks from the position which supplies a power supply to a radio mouse, both have an absolute difference. That is, although it is not technically impossible to carry out the radio transmission of the power supply energy in a separate type, from the field of spurious radiation regulation, it is hopelessly disadvantageous. By considering as the employment form of a mouse / pad one apparatus, as a result to which proximity transmission of power is attained, the spurious radiation problem was conquered and a cell loess code free-lancer's purpose has been attained in this invention.

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## EXAMPLE

[Example] It is a main point to have the pad coils Lx and Ly in the mouse pad 2 used for a mouse 1 by becoming the mouse coupling coil Lm, this, and a pair, and for positive feedback to occur between I/O of an active circuit 3 by agency of a coupling coil Lm, and to constitute VCO from this invention. This thing is first explained based on a drawing. Drawing 2 shows two pad coils Lx and Ly laid by the upper surface of a mouse pad 2 as an example without a mutual inductance. Coils Lx and Ly have composition which the magnetic flux generated since the flowing current lies at right angles also intersects perpendicularly, and does not have a mutual inductance. Although it will be tintured with distributed constant-character if the line interval which adjoins each other in each coil is too narrow, a distributed constant-property can be disregarded if a line interval is taken several or more times to line breadth. In consideration of this point, it shall be considered that application of this coil in this invention is mere WIRE. In the pad coils Lx and Ly, since the current of a retrose is flowing mutually to adjacent WIRE, the electromagnetic wave radiated from each WIRE is offset, and at the distant place (for example, 3m), radiation electromagnetic field become a low thing from a mouse pad extremely.

[0012] The view 3 shows the situation of the electromagnetic coupling at the time of making Lm coil with the same pitch as Lx and the comb type coil like Ly counter. Although RF generator Es is connected with Lx coil as an example of representation and this view shows that an induced voltage occurs to Lm coil, the induced voltage Eo generated when Lm coil is shifted in the direction of X becomes as it is shown in a view 4. this principle -- an Inductsyn -- it is put in practical use as a precise length measuring machine with the tradename

[0013] Although the above-mentioned length measuring machine was single dimension-movement, the way of thinking which progressed rapidly to developing this principle to the-like 2-dimensional movement of a mouse much more was required. It says because a mouse is accompanied by several 10-degree rotation at the same time it exercises two-dimensional on a mouse pad. The situation is shown in the view 5. Therefore, when a mouse is equipped with Lm coil of the configuration shown in the 3rd view, an induced voltage will be sharply changed to rotation of a mouse. since the purpose of this invention measures the movement magnitude of a mouse from change of the amplitude of the induced voltage produced for every pitch when the mouse coil Lm is moved -- there is nothing -- the mouse coil Lm -- interceding -- the pad coils Lx and Ly -- electromagnetism -- there is how it is made to interfere-like That is, it is making Lx generate an induced voltage in the magnetic field which Lm receives the magnetic field produced, for example in Ly, an induced voltage generates in Lm, and Lm generates.

[0014] In order to attain this purpose, the concentric circle coil was suggested as Lm with which the mouse like a view 6 should be equipped. When the current of a retrose is mutually passed in this concentric circle coil, the pattern of the voltage in which Coil Lx carries out induction is shown in the view 6 or the 7th view. However, with a concentric circle coil with one even times the diameter of 1/2P (1/2 pitch) of this, a phase is reversed a left half and in the right half of a concentric circle, and any induced voltage is not produced in Coil Lx, either. That is, the induced voltage which A and a generate in drawing will become reverse. However, in the concentric circle with one odd times the diameter of 1/2P of this, the induced voltage of a right half and a left half is in phase, and is helping each other. Therefore, it turns out that an electromagnetic coupling is improved the concentric circle with the latter diameter to Lx and Ly coil. Although the view 6 and the view 7 showed combination with the concentric circle coil Lm and Lx coil, this situation with the same completely said of Lm and the Ly coil is clear. In addition, when a mouse is equipped with such a concentric circle coil, the induced voltage generated in a coil completely becomes unrelated to rotation of a mouse.

[0015] 1/2P shifted mutually four 1 / 4 partial circles which have one even times the radius of 1/2P of this as another idea of the mouse coil which carries out an electromagnetic coupling to the comb type coil [ like ] which are Lx and Ly as shown in a view 8 and a view 9 odd times, and the coil which connects in a straight line and is concentric-circle-ized was suggested. The direction of the mouse to a mouse pad is turned to, when you want to give the this time maximum degree of coupling, since the probability that it is suitable in the direction of Y of a view 1 is the highest.

[0016] The induced voltage produced between said concentric circle mouse coil Lm, the pad coil Lx, or Ly becomes as it is shown in a view 11. That is, as the 4th view showed, there is no NARUPOINTO whose combination is completely lost to the position of a mouse, and change of the induced voltage accompanying movement of Lm coil serves as a property which required light AM. This is for NARUPOINTO to disappear for the concentric circle coil which crosses Lx or Ly coil, and aslant. Since NARUPOINTO does not occur, an oscillation does not stop to the movement of a mouse and this thing is very convenient to the purpose of this invention.

[0017] The view 10 shows an example of the method of connecting for passing the current of an opposite direction mutually to the concentric circle coil. In this drawing, a coil portion perpendicular to the X-axis has the strong combination with Lx coil



which is parallel to this, since a level portion produces the strong combination with Ly coil, connection of concentric circle each coil avoids a perpendicular level portion, and it is connected.

[0018] the electromagnetism of the pad coils Lx and Ly in which a view 12 does not have a mutual inductance, and the mouse coil Lm -- the circuit diagram which simulates a-like joint relation is shown The degree of coupling of Lx, Lm, and Ly and Lm was set as 0.05 here. The operation Q of a mouse resonance circuit is about 12. Calculation of the transmission characteristic from Ly when connecting the source of a signal of 330 ohms of source resistances with Ly now, and connecting the load of 330 ohms with Lx coil to Lx obtains a view 13 and a view 14. A view 12 shows the frequency characteristic of a power transducer gain, and the view 13 expresses the phase characteristic. Power transfer characteristics give the maximum gain by 12.8MHz of resonance frequency by Lm coil and the capacitor C1 by the side of a mouse. On the other hand, the phase characteristic has produced the phase contrast of 180 degrees in 12.98MHz slightly higher than resonance frequency. 12. The transducer gain in 98 MHz is [ about ]. -Since it is 45dB, the gain of an active circuit 3 will oscillate on the frequency to which it will depend for the VCO of a view 15 on the resonance frequency by the side of a mouse by +45dB or more if I/O phase contrast is 180 degrees. What is necessary is just to make terminal strapping of Lx or Ly reverse, when I/O phase contrast uses the active circuit which is 0 degree. Moreover, when the phase contrast of an active circuit is not 0 degree or exactly 180 degrees, the resonance circuit by the side of a mouse will carry out phase correction, and will oscillate on the frequency which serves as 0 or phase contrast of 180 degrees exactly. Since rotation of the phase of a resonance circuit is steep near the resonance frequency, VCO will be oscillated near the resonance frequency and oscillation frequency will be determined as a target in large numbers by the circuit constant of the resonance circuit of a mouse. Therefore, if a signal is impressed to a varactor diode being inserted by a part of resonance circuit of a mouse, the frequency-modulation wave according to the signal can be obtained.

[0019] The view 16 shows the component of a mechanism-this invention. The mouse pad consists of the pad base 10, a magnetic sheet 16, a coil layer 14, and facing 15. The pad base 10 has convenient use of a plastic-molding article. Since what has few RF loss is suitable for the magnetic sheet 16, its ferrite rubber sheet is the optimal. A double printed board with the thin coil layer 14 is used, and Lx and Ly coil are constituted by the both sides. The material which improves slipping to a mouse main part, and prevents a slip to a mouse ball is used at the same time facing 15 protects Lx and Ly coil. A high quality material for this purpose is developed, and it is used for the usual mouse mat recently. The base of a mouse is unified and equipped with the magnetic sheet 12, the coil layer 11, and the surface-protection film 13 with adhesives.

[0020] A view 17 is a circuit diagram of the mouse equipment of this invention to which what was explained until now was summarized on the whole. Equipment is first divided roughly into a mouse 1 and a mouse pad 2. Physically, although a mouse is located on a mouse pad, in order to make a circuit legible, only the mouse coil Lm is drawn in piles on the pad coils Lx and Ly. An active circuit 3 is in a mouse pad 2, and the pad coils Lx and Ly are connected to the input/output port. VCO equips an automatic gain control circuit 4, and has the function to suppress change of oscillation voltage to which the change of the degree of electromagnetic coupling to the movement of a mouse takes place owing to. As mentioned above, since it is arranged so that it may not have a mutual inductance, the pad coils Lx and Ly cannot be oscillated by itself, when a mouse is not located on a pad. however -- if a mouse is located on a pad and electromagnetic field are mediated with Coil Lm -- both -- electromagnetism -- it joins together and oscillates-like

[0021] An inductance is connected to a mouse 1 at the mouse coil Lm for combination in the addition coil La of an amendment sake, resonant-capacitor Cm, the amendment capacitor calcium, and variable capacitance diode (variable reactor) Cv, and the resonance circuit is formed. Resonance frequency is examined experimentally and determined as the point that energy efficiency is the highest. A tap is prepared suitably for the mouse coil Lm for combination, or the addition coil La, the load of the diodes D1 and D2 for rectification and the smoothing capacitors Cr and Ck is carried out, and DC power supply are made from oscillation high-frequency voltage. As a capacity of DC power supply, it recommends from the actual result of the present radio mouse, and 2.5mA of voltage 2.5V current is enough. The power supply of a mouse CPU 7 can be provided with this with a margin in encoder 5 row. That is, it is necessary to take out 6.25mW energy from VCO. Although this energy is supplied from the DC power supply of a computer through a RF oscillation, it considers oscillation efficiency to be 25%, and is needed 25mW. However, the electric power supply of this level is completely satisfactory for a computer.

[0022] The information on an encoder 5 and a button switch 6 is changed into a serial code with a mouse CPU 7. Although this is 0 or 1 signal logically, since it is hi of voltage, and the signal of Lo electrically, it impresses this signal to a varactor diode Cv, and carries out frequency modulation of the oscillation frequency. The capacitor Cb connected with the serial code output terminal of a mouse CPU 7 is an object for a RF bypass.

[0023] The high-frequency voltage by which frequency modulation was carried out is taken out from the output side of an active circuit 3, and is inputted into a frequency discriminator 8. The serial code signal to which it restored and which Mouse CPU generated outputs a frequency-modulation wave here. This recovery signal is supplied to CPU9 of a mouse pad. A view 17 is drawn corresponding to the mouse signal-transmission method in the PS/2 mode which has spread most now.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

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[0014] In order to attain this purpose, the concentric circle coil was suggested as Lm with which the mouse like a view 6 should be equipped. When the current of a retrose is mutually passed in this concentric circle coil, the pattern of the voltage in which Coil Lx carries out induction is shown in the view 6 or the 7th view. However, with a concentric circle coil with one even times the diameter of  $1/2P$  ( $1/2$  pitch) of this, a phase is reversed a left half and in the right half of a concentric circle, and any induced voltage is not produced in Coil Lx, either. That is, the induced voltage which A and a generate in drawing will become reverse. However, in the concentric circle with one odd times the diameter of  $1/2P$  of this, the induced voltage of a right half and a left half is in phase, and is helping each other. Therefore, it turns out that an electromagnetic coupling is improved the concentric circle with the latter diameter to Lx and Ly coil. Although the view 6 and the view 7 showed combination with the concentric circle coil Lm and Lx coil, this situation with the same completely said of Lm and the Ly coil is clear. In addition, when a mouse is equipped with such a concentric circle coil, the induced voltage generated in a coil completely becomes unrelated to rotation of a mouse.

[0015]  $1/2P$  shifted mutually four  $1/4$  partial circles which have one even times the radius of  $1/2P$  of this as another idea of the mouse coil which carries out an electromagnetic coupling to the comb type coil [ like ] which are Lx and Ly as shown in an octavus view and a view 9 odd times, and the coil which connects in a straight line and is concentric-circle-ized was suggested. The direction of the mouse to a mouse pad is turned to, when you want to give the this time maximum degree of coupling, since the probability that it is suitable in the direction of Y of a view 1 is the highest.

[0016] The induced voltage produced between said concentric circle mouse coil Lm, the pad coil Lx, or Ly becomes as it is shown in a view 11. That is, as the 4th view showed, there is no NARUPOINTO whose combination is completely lost to the position of a mouse, and change of the induced voltage accompanying movement of Lm coil serves as a property which required light AM. This is for NARUPOINTO to disappear for the concentric circle coil which crosses Lx or Ly coil, and aslant. Since NARUPOINTO does not occur, an oscillation does not stop to the movement of a mouse and this thing is very convenient to the purpose of this invention.

[0017] The view 10 shows an example of the method of connecting for passing the current of an opposite direction mutually to the concentric circle coil. In this drawing, a coil portion perpendicular to the X-axis has the strong combination with Lx coil which is parallel to this, since a level portion produces the strong combination with Ly coil, connection of concentric circle each coil avoids a perpendicular level portion, and it is connected.

[0018] the electromagnetism of the pad coils Lx and Ly in which a view 12 does not have a mutual inductance, and the mouse coil Lm -- the circuit diagram which simulates a-like joint relation is shown The degree of coupling of Lx, Lm, and Ly and Lm was set as 0.05 here. The operation Q of a mouse resonance circuit is about 12. Calculation of the transmission characteristic from Ly when connecting the source of a signal of 330 ohms of source resistances with Ly now, and connecting the load of 330 ohms with Lx coil to Lx obtains a view 13 and a view 14. A view 12 shows the frequency characteristic of a power transducer

gain, and the view 13 expresses the phase characteristic. Power transfer characteristics give the maximum gain by 12.8MHz of resonance frequency by Lm coil and the capacitor C1 by the side of a mouse. On the other hand, the phase characteristic has produced the phase contrast of 180 degrees in 12.98MHz slightly higher than resonance frequency. 12. The transducer gain in 98 MHz is [ about ]. -Since it is 45dB, the gain of an active circuit 3 will oscillate on the frequency to which it will depend for the VCO of a view 15 on the resonance frequency by the side of a mouse by +45dB or more if I/O phase contrast is 180 degrees. What is necessary is just to make terminal strapping of Lx or Ly reverse, when I/O phase contrast uses the active circuit which is 0 degree. Moreover, when the phase contrast of an active circuit is not 0 degree or exactly 180 degrees, the resonance circuit by the side of a mouse will carry out phase correction, and will oscillate on the frequency which serves as 0 or phase contrast of 180 degrees exactly. Since rotation of the phase of a resonance circuit is steep near the resonance frequency, VCO will be oscillated near the resonance frequency and oscillation frequency will be determined as a target in large numbers by the circuit constant of the resonance circuit of a mouse. Therefore, if a signal is impressed to a varactor diode being inserted by a part of resonance circuit of a mouse, the frequency-modulation wave according to the signal can be obtained.

[0019] The view 16 shows the component of a mechanism-this invention. The mouse pad consists of the pad base 10, a magnetic sheet 16, a coil layer 14, and facing 15. The pad base 10 has convenient use of a plastic-molding article. Since what has few RF loss is suitable for the magnetic sheet 16, its ferrite rubber sheet is the optimal. A double printed board with the thin coil layer 14 is used, and Lx and Ly coil are constituted by the both sides. The material which improves slipping to a mouse main part, and prevents a slip to a mouse ball is used at the same time facing 15 protects Lx and Ly coil. A high quality material for this purpose is developed, and it is used for the usual mouse mat recently. The base of a mouse is unified and equipped with the magnetic sheet 12, the coil layer 11, and the surface-protection film 13 with adhesives.

[0020] A view 17 is a circuit diagram of the mouse equipment of this invention to which what was explained until now was summarized on the whole. Equipment is first divided roughly into a mouse 1 and a mouse pad 2. Physically, although a mouse is located on a mouse pad, in order to make a circuit legible, only the mouse coil Lm is drawn in piles on the pad coils Lx and Ly. An active circuit 3 is in a mouse pad 2, and the pad coils Lx and Ly are connected to the input/output port. VCO equips an automatic gain control circuit 4, and has the function to suppress change of oscillation voltage to which the change of the degree of electromagnetic coupling to the movement of a mouse takes place owing to. As mentioned above, since it is arranged so that it may not have a mutual inductance, the pad coils Lx and Ly cannot be oscillated by itself, when a mouse is not located on a pad. however -- if a mouse is located on a pad and electromagnetic field are mediated with Coil Lm -- both -- electromagnetism -- it joins together and oscillates-like

[0021] An inductance is connected to a mouse 1 at the mouse coil Lm for combination in the addition coil La of an amendment sake, resonant-capacitor Cm, the amendment capacitor calcium, and variable capacitance diode (variable reactor) Cv, and the resonance circuit is formed. Resonance frequency is examined experimentally and determined as the point that energy efficiency is the highest. A tap is prepared suitably for the mouse coil Lm for combination, or the addition coil La, the load of the diodes D1 and D2 for rectification and the smoothing capacitors Cr and Ck is carried out, and DC power supply are made from oscillation high-frequency voltage. As a capacity of DC power supply, it recommends from the actual result of the present radio mouse, and 2.5mA of voltage 2.5V current is enough. The power supply of a mouse CPU 7 can be provided with this with a margin in encoder 5 row. That is, it is necessary to take out 6.25mW energy from VCO. Although this energy is supplied from the DC power supply of a computer through a RF oscillation, it considers oscillation efficiency to be 25%, and is needed 25mW. However, the electric power supply of this level is completely satisfactory for a computer.

[0022] The information on an encoder 5 and a button switch 6 is changed into a serial code with a mouse CPU 7. Although this is 0 or 1 signal logically, since it is hi of voltage, and the signal of Lo electrically, it impresses this signal to a varactor diode Cv, and carries out frequency modulation of the oscillation frequency. The capacitor Cb connected with the serial code output terminal of a mouse CPU 7 is an object for a RF bypass.

[0023] The high-frequency voltage by which frequency modulation was carried out is taken out from the output side of an active circuit 3, and is inputted into a frequency discriminator 8. The serial code signal to which it restored and which Mouse CPU generated outputs a frequency-modulation wave here. This recovery signal is supplied to CPU9 of a mouse pad. A view 17 is drawn corresponding to the mouse signal-transmission method in the PS/2 mode which has spread most now.

[0024]

[Effect of the Invention] Since this invention is constituted as explained above, it has the effect which is indicated below.

[0025] Since two coils connected to the active circuit 3 which the mouse pad equipped, and this I/O constitute VCO by combining with the resonance circuit (Lm, La, Cm, calcium, Cv) with which the mouse was equipped, they rectify oscillation voltage by the mouse side, and can make DC power supply.

[0026] Since it is decided by the resonance circuit by the side of a mouse in large numbers that the oscillation frequency of VCO will be a target, frequency modulation of it can be carried out by impressing the serial code which a mouse CPU 7 outputs to a varactor diode Cv.

[0027] Since a frequency-modulation wave can be taken out by the mouse pad side, the radio transmission of a mouse signal is attained inevitably.

[0028] since even VCO comes out as mentioned above and generation of DC power supply and the radio transmission of a mouse signal are attained, there are few part mark and they can make cell loess code free mouse equipment from cheap cost

[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

- [Drawing 1] The employment gestalt of the mouse equipment of this invention is shown.
- [Drawing 2] The I/O coil laid to a mouse pad.
- [Drawing 3] The electromagnetic induction between comb type coils is shown.
- [Drawing 4] The electromagnetic-induction voltage generated in the circuit of drawing 3 is shown.
- [Drawing 5] The movement of the mouse on a mouse pad is shown.
- [Drawing 6] The relation of the electromagnetic induction of a concentric circle coil with one even times the radius of 1/2P of this and a comb type coil is shown.
- [Drawing 7] The relation of the electromagnetic induction of a concentric circle coil with one odd times the radius of 1/2P of this and a comb type coil is shown.
- [Drawing 8] Drawing which shifted mutually four 1 / 4 partial circles with one even times the radius of 1/2P of this 1/2P.
- [Drawing 9] The concentric circle coil which connected the partial coil of drawing 8 in a straight line, and made it.
- [Drawing 10] The continuation of a concentric circle coil is shown.
- [Drawing 11] The electromagnetic-induction voltage characteristic between a comb type coil and a concentric circle coil.
- [Drawing 12] The simulation circuit diagram of a comb type coil, a concentric circle coil, and a resonant capacitor.
- [Drawing 13] The transfer-power-gain property of a simulation circuit diagram.
- [Drawing 14] Transfer power phase \*\*\*\* of a simulation circuit diagram.
- [Drawing 15] VCO which used the simulation circuit diagram.
- [Drawing 16] ~~The mechanism cross section of a mouse and a mouse pad.~~
- [Drawing 17] The whole cell loess code free mouse equipment circuit diagram.

[Description of Notations]

- 1 Mouse
- 2 Mouse Pad
- 3 Active Circuit
- 4 Automatic Gain Control Circuit
- 5 Encoder
- 6 Button Switch
- 7 Mouse CPU
- 8 Frequency Discriminator
- 9 Mouse Pad CPU
- 10 Mouse Pad Base
- 11 Mouse Coil Layer
- 12 Magnetic Sheet for Mice
- 13 Surface-Protection Layer for Mice
- 14 Mouse Pad Coil Layer
- 15 Mouse Pad Facing
- 16 Magnetic Sheet for Mouse Pads
- Lx, Ly Mouse pad comb type coil
- Lm, La A mouse coupling coil and addition coil
- Cm Mouse resonance capacitor
- calcium Mouse addition capacitor
- Cv Varactor diode
- Cb RF bypass capacitor
- D1, D2 Diode for RF rectification
- Cr, Ck Smoothing capacitor
- DAT Data to a computer
- CLK Clock to a computer
- Vcc Power supply from a computer
- Gnd Grounding conductor

Es Source of a signal  
Eo Induced voltage  
P The pitch of a comb type coil

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[Translation done.]

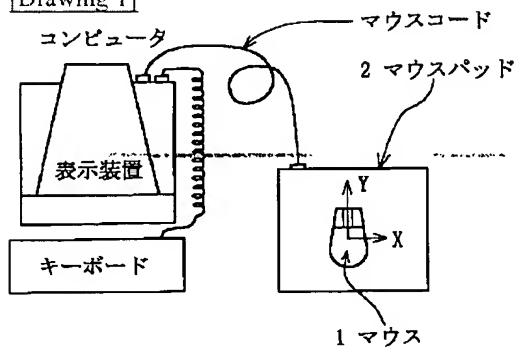
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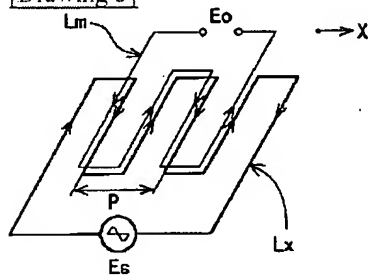
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DRAWINGS

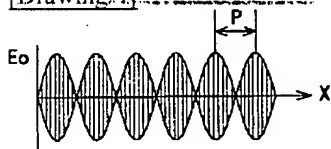
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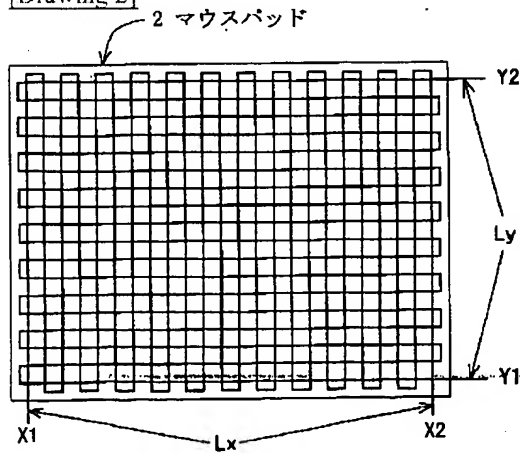
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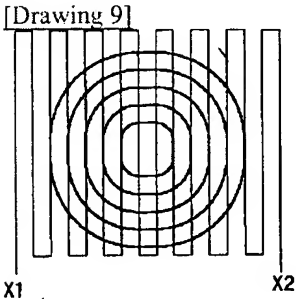
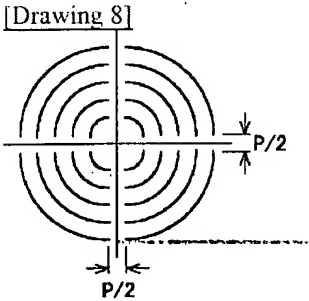
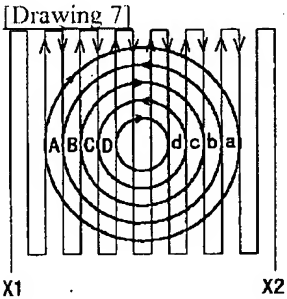
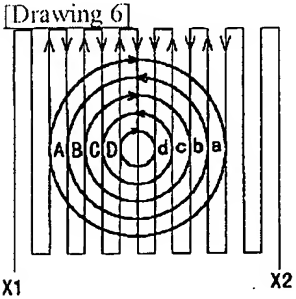
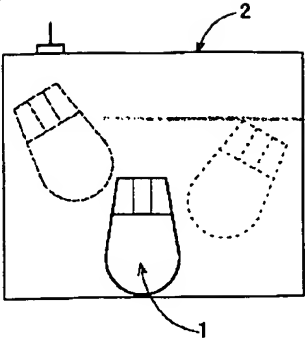
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[Drawing 2]

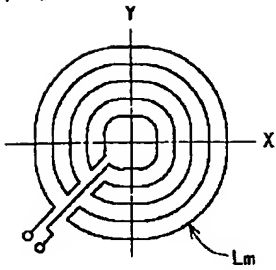


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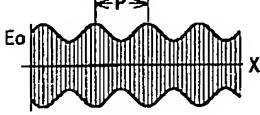


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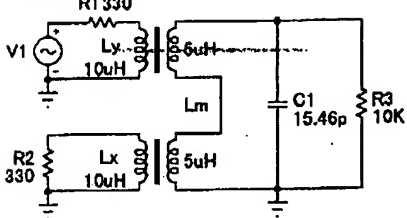




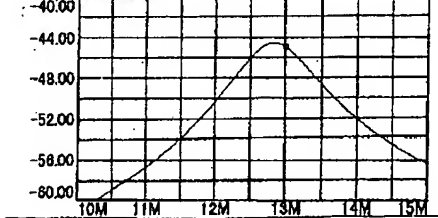
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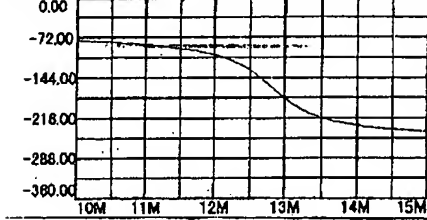
[Drawing 12]



[Drawing 13]

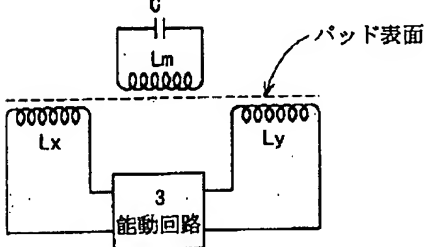


[Drawing 14]



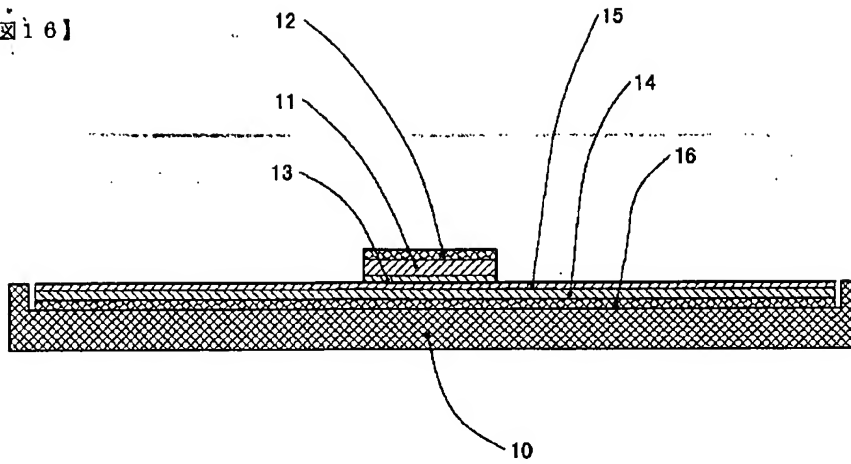
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[Drawing 15]

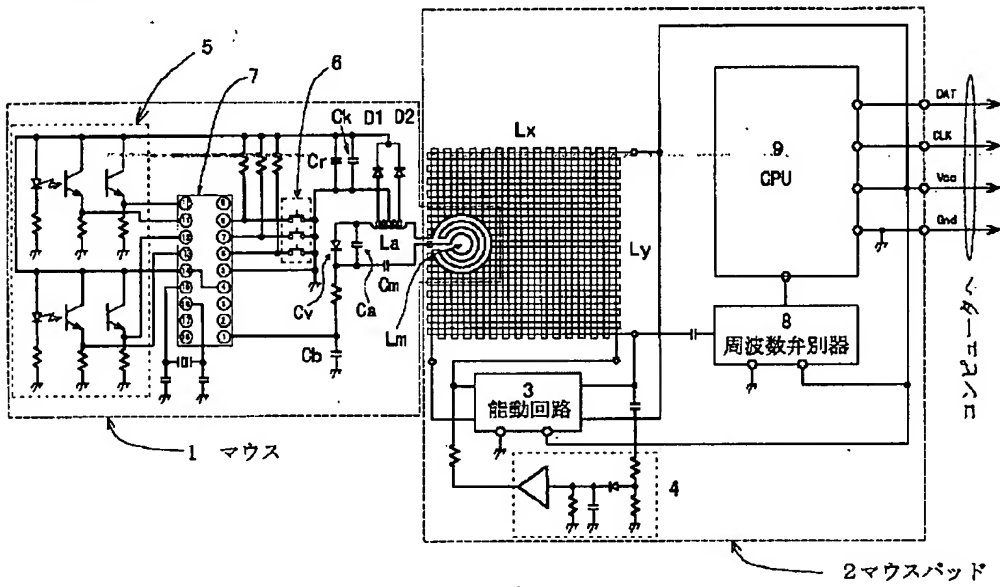


[Drawing 16]

【図 16】



[Drawing 17]  
【図 17】



[Translation done.]